REMARKS

Claims 1 - 3 and 5 - 9 have been amended, and claim 14 has been added in order to more particularly point out, and distinctly claim the subject matter to which the applicants regard as their invention. The applicants respectfully submit that no new matter has been added. It is believed that this Amendment is fully responsive to the Office Action dated April 27, 2005.

Claims 1 - 14 remain in this patent application.

The specification and the claim language have been objected to due to certain informalities, which the Examiner deemed needed correction, as set forth in items 3 and 4, pages 2 and 3 of the outstanding Action. The applicants respectfully request reconsideration of these objections.

The applicants respectfully submit that the amendments to the specification and claims obviate the outstanding objections thereto. Accordingly, the withdrawal of the objections to the specification and claims is in order, and is therefore respectfully solicited.

At the outset, the applicants thank the Examiner for now indicating that claim 13 is allowed, and that claims 11 and 12 contain allowable subject matter (as noted in item 21, page 6 of the outstanding Action).

With respect to the Examiner's comments on the applicants' Figure 1, the applicants have amended the sentence bridging pages 14 and 15 of the applicants' specification so as to read as follows:

> When the neutral particles are irradiated to the target 15, *atoms of the target 15 are sputtered as sputtered particles 23, and* a thin film starts being formed on the surface of the substrate 17.[1/]

With respect to the Examiner's comments on Figure 5, the applicants have changed "discharging electrons" to "discharging electrons 122" in line 7, page 3 of the applicants' specification. In this manner, elements labeled by reference numbers 23 and 122, as shown in the applicants' Figures 1 and 5, respectively, are supported in the discussions thereof in the applicants' specification.

Accordingly, the withdrawal of the outstanding objections to the drawings is in order, and is therefore respectfully solicited.

[1/] For example, see, lines 8 - 10 concerning the sputtered particles 123 illustrated in Figure 5.

Claims 3 and 4 stand rejected under 35 USC §112, second paragraph, due to certain informalities set forth in items 7 and 8, pages 3 and 4 of the outstanding Action. The applicants respectfully request reconsideration of this rejection.

As indicated above, claims 3 and 4 have been amended in order to more particularly point out, and distinctly claim the subject matter to which the applicants regard as their invention, and in order to correct certain informalities therein, including those pointed out by the Examiner.

Accordingly, the withdrawal of the outstanding indefiniteness rejection under 35 USC §112, second paragraph, is in order, and is therefore respectfully solicited.

As to the merits of this case, claims 1 - 10 stand rejected under 35 USC §102(b) as being anticipated by Collins (U.S. Patent No. 6,252,354). The applicants respectfully request reconsideration of this rejection.

The matching box according to the applicants' present invention and the matching box described in Collins are different in point of connecting variable inductance elements.

Attached is Figure a, which is a schematic circuit diagram simplified by omitting a capacitor from a matching box of the present invention. The attached Figure b is a simplified schematic circuit diagram of a matching box according to Collins.

In the matching box of the applicants' present invention, "a first control winding" is connected in series between an RF source and a coil. However, in Collins' matching box, a capacitor of "pi-network" is merely replaced with a variable capacitor or a parallel connected circuit composed of a fixed capacitor and a variable inductor, and series inductor 190 is not variable.

The applicants' invention is directed to a matching box 2 connected to a plasma generator 12, positive ion flow 20 being released from the plasma generator 12 into a vacuum chamber 11. Within the vacuum chamber 11, electrons generated by the ionization of ionization gas introduced into an electron generator 13 are applied to the positive ion flow 20, the electrons being neutralized by the positive ions. Neutral particles are then irradiated to a target 15 so that atoms of the target 15 are sputtered as sputtered particles 123, which in turn begin the formation of a thin film on the surface of a substrate 17. As described in lines 2 - 7, page 15 of the applicants' specification:

> [t]he impedance of an electric circuit composed of the coil 42 and the ionization chamber 41 varies between before and after the generation of plasma 43 in the ionization chamber 41. Accordingly, it is necessary to match the impedance by varying the impedance inside the matching box 2 when the plasma 43 is formed.

In other words, the absence or existence (formation) of the plasma 43 within the ionization chamber 41 affects the necessary input power for the direct application of voltage to the coil 42 surrounding the ionization chamber 41. As more particularly explained in lines 10 - 17, page 18 of the applicants' specification:

> [m]ore specifically, when the plasma 43 is generated in the ionization chamber 41, large input power is necessary. Accordingly, the inductance of the second variable inductance element 35 is increased to apply large voltage to the coil 42.
>
> After the plasma 43 is formed once, the inductance of the second variable inductance element 35 is decreased so that the magnitude of voltage is optimally adjusted to stably maintain the plasma 43.

That is, the applicants' invention includes a controlled circuit 66, which specifically measures the current flowing through the coil 42 that surrounds the ionization chamber 41, the measurement of the magnitude of the current detecting the disappearance of plasma 43 within the ionization chamber 41, which in turn affects the impedance of the first and second variable inductance elements 31, 35 so as return to an impedance before the generation of plasma.

As a result, the applicants' invention has the effect of reducing the down time to less than 100 mS due to the disappearance and regeneration of plasma 43; thereby, not adversely affecting film thickness accuracy formed on the target 15.

On the other hand, although Collins detects current from a coil antenna, such detection of the current is accomplished as follows:

> [a] current sensor 410 monitors the RF current to the coil antenna 120. A frequency servo 420 periodically samples the coil antenna current sensed by the current sensor 410 and uses that information to control the frequency of the RF source signal generator 140.[2/]

In other words, Collins requires a separate sensor 410 for monitoring the RF current of the coil antenna 120 so that the periodic detection of coil antenna current is used for controlling the frequency of the RF source signal generator 140.

In the applicants' invention, although a control circuit 66 is provided for measuring the current flowing through the coil 42, upon detection of the disappearance of plasma 43 by the measurement of the magnitude of the current, "the impedance of the first and second variable inductance elements 31 and 35 is returned to that before the generation of the plasma" (lines 8 - 12, page 19 of the applicants' specification). In other words, upon the detection of the disappearance of the plasma 43 by the measurement of the magnitude of the current, the inductance of the second variable inductance element 35 is increased so as to apply a large voltage to the coil 42. Upon the formation of plasma 43, the inductance of the second variable inductance 35 is decreased so that the magnitude of the voltage is optimally adjusted in the coil 42 so as to stably maintain the plasma 43.

[2/] See, lines 30-35, column 7 in Collins.

Such structural arrangements of the applicants' invention (i.e., the inductance of the variable inductance element being controlled based on plasma generation in the plasma generator and for applying voltage to the coil upon detection of the absence of plasma) are distinguishable over Collins' use of the information concerning the current in the coil antenna 120 for controlling the frequency of an RF source signal generator 140.

Accordingly, the applicants have highlighted such distinguishable structural arrangement in each of independent claims 1, 2 and 5 by more particularly reciting that the impedance of the claimed main winding is controlled based on a magnitude of direct current flowing through the claimed control winding, "which is in turn based on plasma generation in said plasma generator."

As to independent claim 9, this claim now more particularly reciting that the "inductance of said variable inductance element is controlled based on plasma generation in said plasma generator."

In view of the above, not all of the claimed elements or features, as now set forth in independent claims 1, 2, 5 and 9 (and the claims respectively dependent therefrom), are found in exactly the same situation and united in the same way to perform the identical function in Collins' apparatus. Thus, there can be no anticipation of the applicants' claimed invention under 35 USC §102(b) based on the teachings of Collins.

Accordingly, the withdrawal of the outstanding anticipation under 35 USC §102(b) based on Collins (U.S. Patent No. 6,252,354) is in order, and is therefore respectfully solicited.

If, for any reason, it is felt that this application is not now in condition for allowance, the Examiner is requested to contact the applicants' undersigned attorney at the telephone number indicated below to arrange for an interview to expedite the disposition of this case.

In the event that this paper is not timely filed, the applicants respectfully petition for an appropriate extension of time. Please charge any fees for such an extension of time and any other fees which may be due with respect to this paper, to Deposit Account No. 01-2340.

Respectfully submitted,

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Enclosure: Figures a and b